

First look of the B lifetime at the lepton+D⁰ data

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**Can we do the lifetime fit with the SVT trigger bias?
Try with real data ...**

lepton + D^0 selection

Same cuts are applied with PR plot.

In addition to it, following cuts are applied.

$$P_T(K,\pi) > 1 \text{ GeV}/c$$

At least one of K and π track have

$$120 < |d_0| < 1000 \text{ } \mu\text{m},$$

Number of silicon $r\phi$ hits ≥ 4

$$L_{xy} (\text{primary-}D^0 \text{ decay}) > 500 \text{ } \mu\text{m}$$

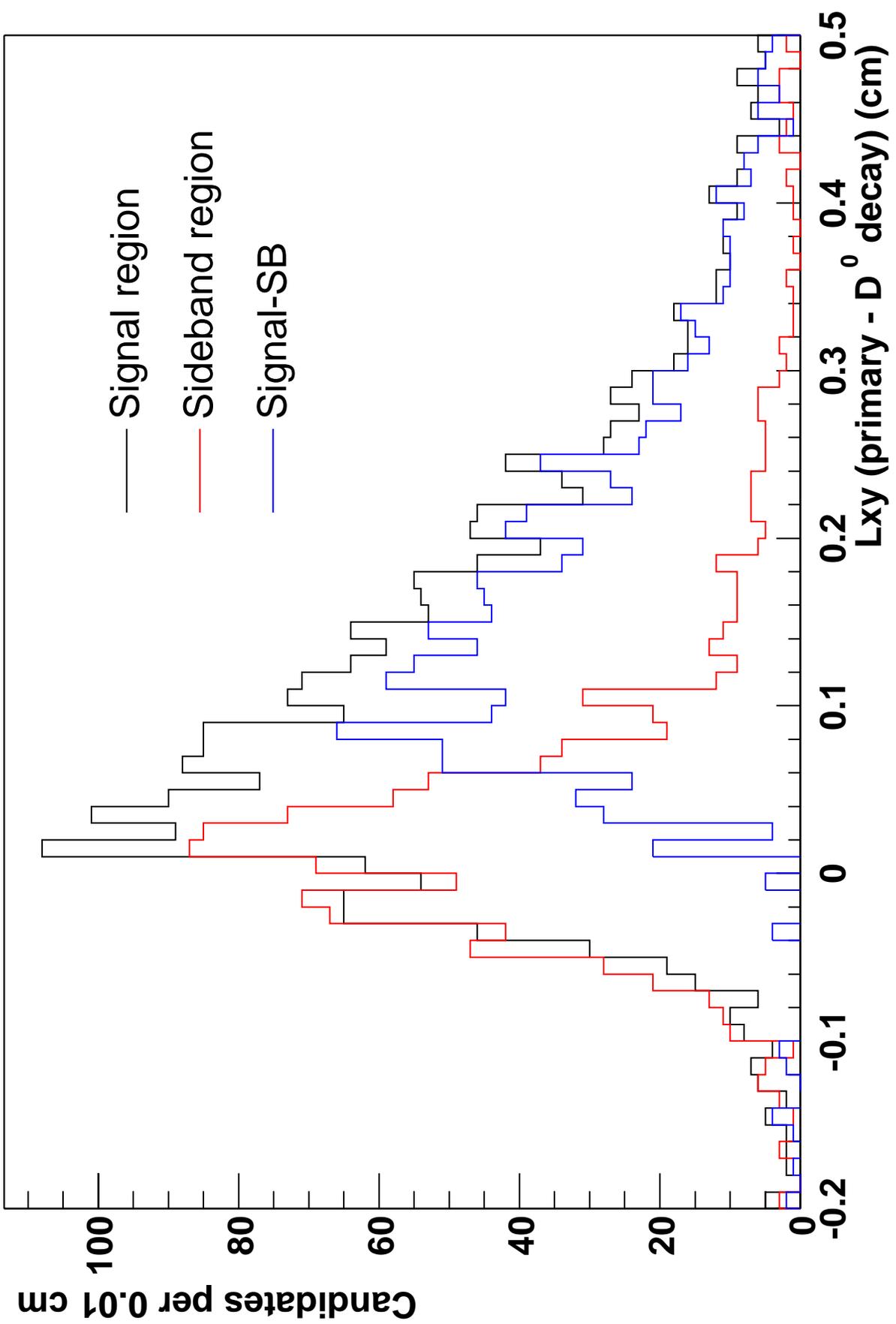
$$|c\tau_{D^0}| < 0.1 \text{ cm}$$

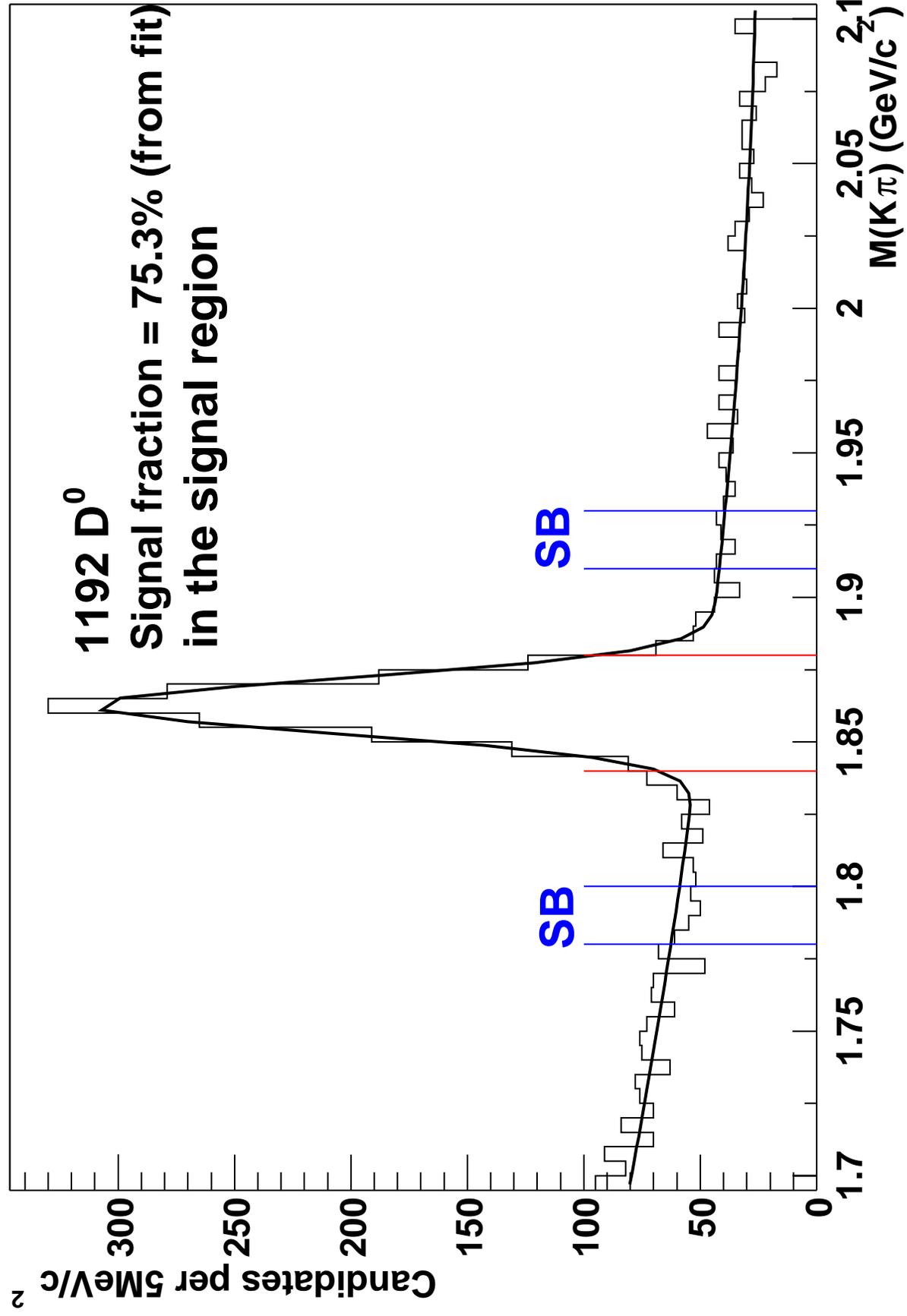
$$-0.2 < c\tau_B^* < 0.5 \text{ cm}$$

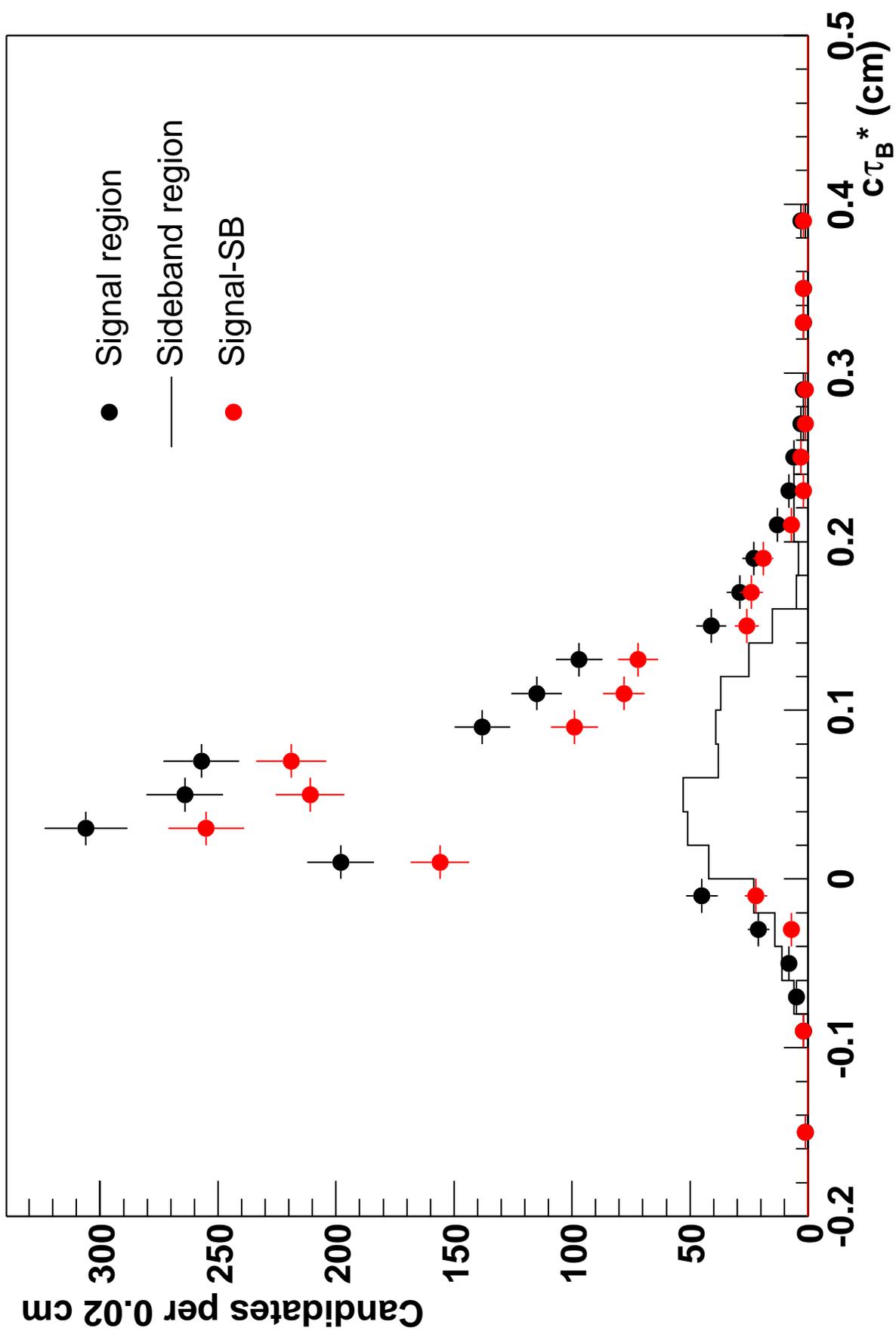
To improve S/N, signal and sideband region is redefined as,

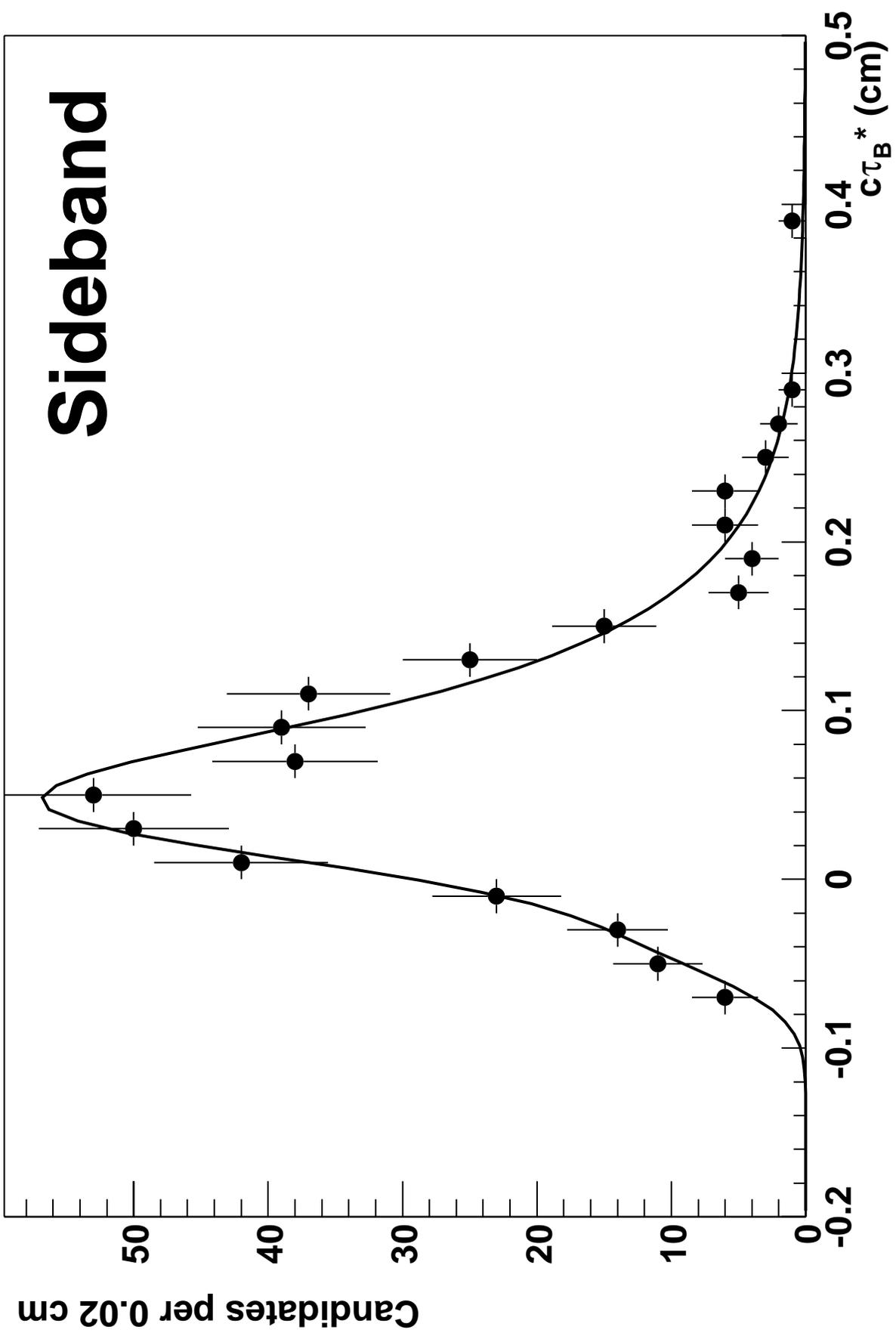
$$\text{Signal region} : 1.84 < M(K\pi) < 1.88 \text{ GeV}/c^2$$

$$\begin{aligned} \text{Sideband} & : 1.78 < M(K\pi) < 1.8 \text{ GeV}/c^2 \\ & : 1.91 < M(K\pi) < 1.93 \text{ GeV}/c^2 \end{aligned}$$









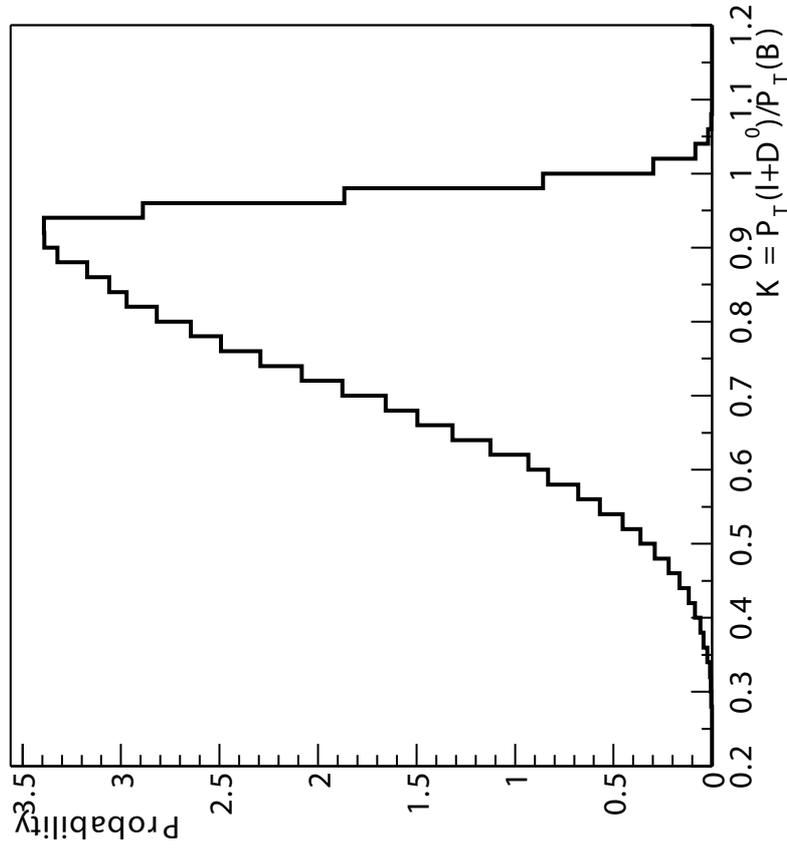
MC sample (Bgenerator + QQ)

Generic B \rightarrow l ν X

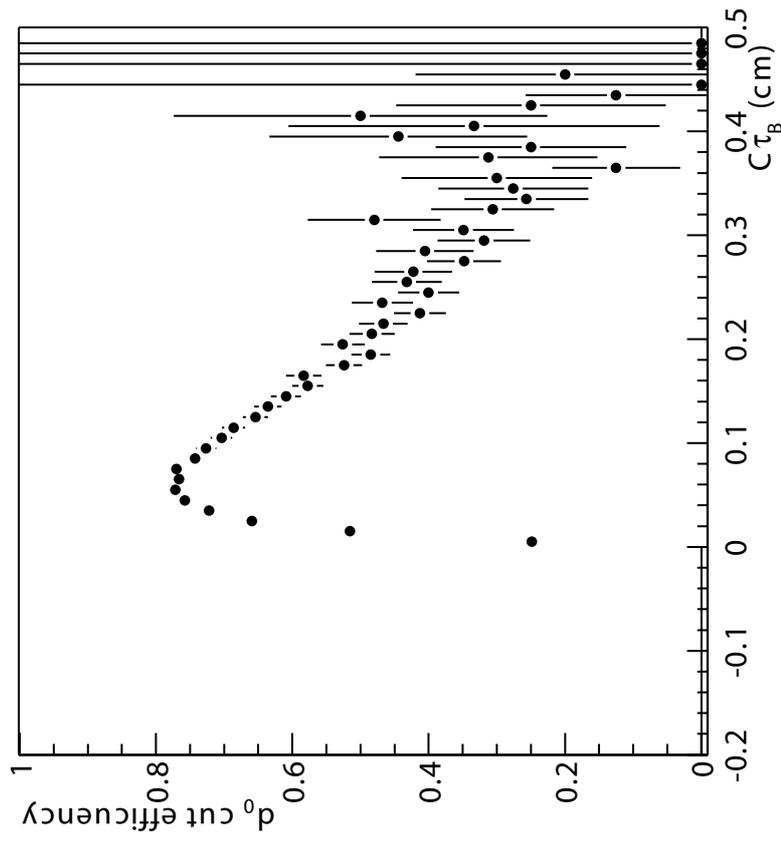
$\hookrightarrow D^0 X'$

$\hookrightarrow K \pi$

K factor



SVT d_0 cut efficiency



Likelihood function \mathcal{L}

$$f(x; c\tau, K) = \theta(x) \frac{K}{c\tau} \exp\left(-\frac{Kx}{c\tau}\right) \epsilon(Kx)$$

where θ is the step function, and ϵ is the d_0 cut efficiency for $c\tau_B$.

$$F(x; c\tau, K) = f(x; c\tau, K) / \int_{-\infty}^{\infty} f(y; c\tau, K) dy$$

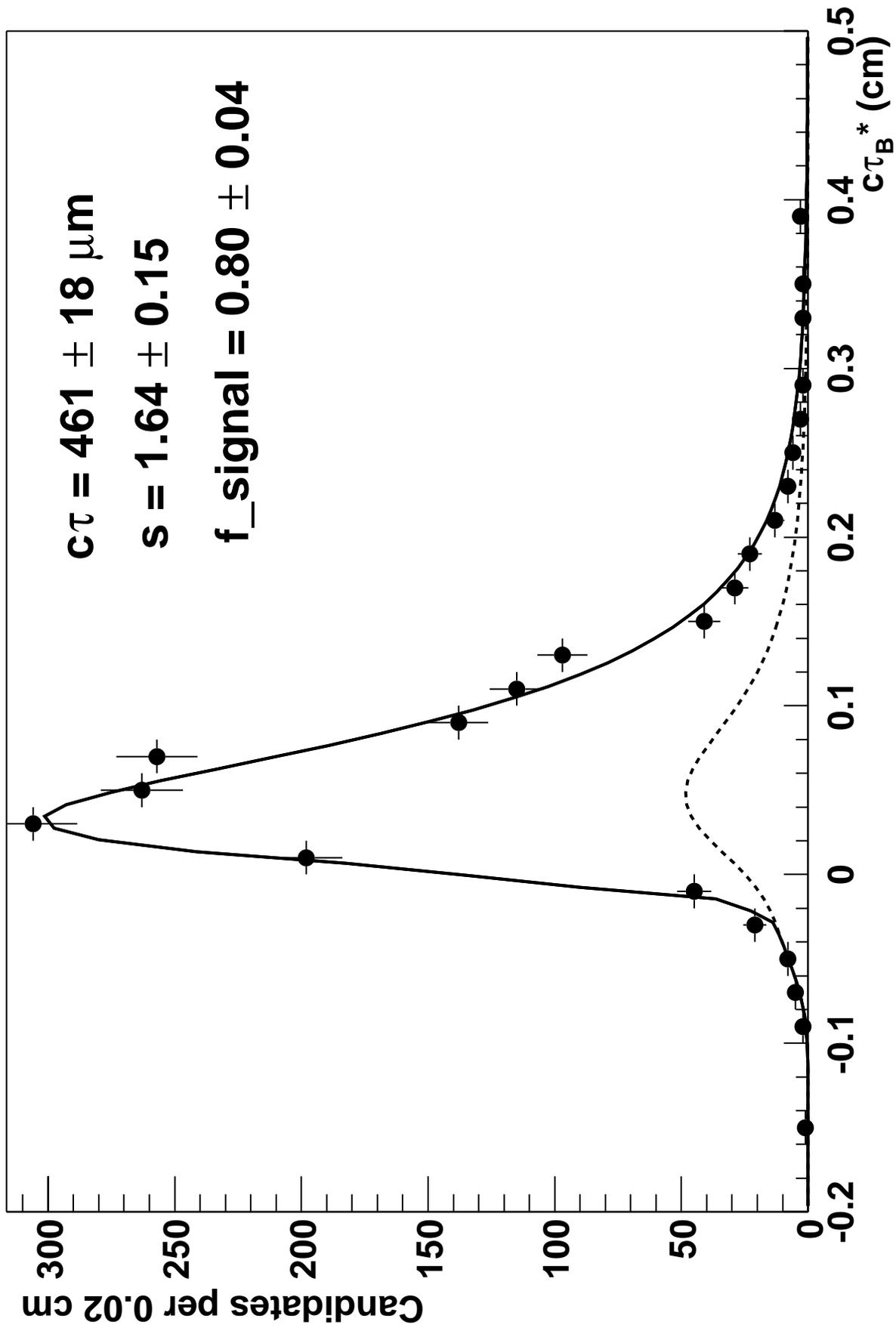
$$\mathcal{F}_{\text{signal}}(x, \sigma; c\tau, s) = F(x; c\tau, K) \otimes G(x, \sigma; s, K) \otimes H(K)$$

$$\text{where } G(x, \sigma; s, K) = \frac{1}{\sqrt{2\pi}s\sigma} \exp\left(-\frac{x^2}{2s^2\sigma^2}\right),$$

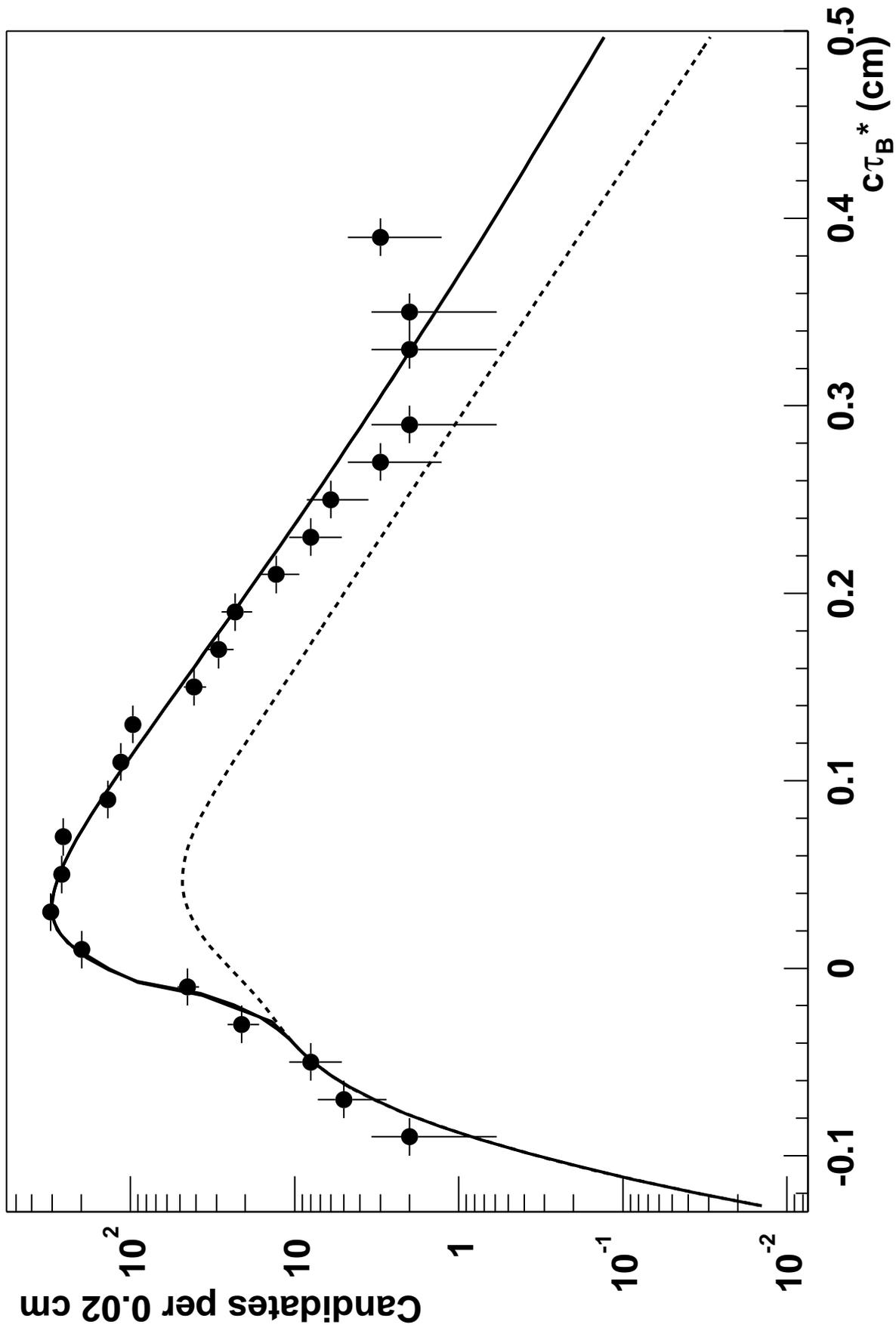
and $H(K)$ is the normalized K factor distribution.

\mathcal{F}_{BG} ... taken from the sideband

$$\mathcal{L} = f_{\text{signal}} \mathcal{F}_{\text{signal}} + (1 - f_{\text{signal}}) \mathcal{F}_{\text{BG}}$$



$\sigma_{\text{signal}} = 10880 \pm 0.04$



Summary & plans

Tried to improve S/N, and
Looked at $c\tau_B^*$ distributions for lepton+ D^0 .
The lifetime fit including SVT efficiency is
converged!

We need ...

More realistic efficiency function and Kfactor
from full simulation.

Simultaneous fit to include $M(K\pi)$, σ_M .

Look at backup datasets to check scale
factor for σ .

Estimate what is the largest contribution
for the systematic uncertainty.